Mg- AND Na-BEARING MUSCOVITE IN THE CRYSTALLINE SCHIST FROM AMAKUSA, NAGASAKI PREFECTURE, JAPAN

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ABSTRACT

2M₄-muscovite with 18 mole % paragonite has c 20.010 Å, slightly smaller than pure potassium muscovite.

INTRODUCTION

A muscovite containing 1.42 weight percent of Na₂O and 3.02 weight percent of MgO occurs in the metamorphosed pegmatite intruded into crystalline schist along the western coast of Shimozima in the Amakusa Islands, Nagasaki Prefecture, Japan. The mode of occurrence of the mica was reported by Tachibana (1967). K-Ar dating of the mineral gave an age of 86 m.y. (Ueda and Onuki, 1968). This note provides the mineralogical properties of the muscovite in some detail.

MINERALOGY

Colorless to pale brownish yellow crystals up to 2 cm wide and 1 cm thick are enclosed in the quartz-albite pegmatite and comprise about 20 to 30 percent of its volume (Fig. 1). The pegmatite body is approximately 1 m thick and 20 m long; it was strongly deformed by successive metamorphism (Tachibana, 1967). About 4 g of hand-picked pure crystals are used for study.

Physical Data. Refractive indices determined by the immersion method using NaD light at 20°C and 2V measured on the universal stage gave; α 1.575 ± 0.001, β 1.598 ± 0.001, γ 1.602 ± 0.001 and γ − α 0.027 and (−) 2V 22°. These values are close to the muscovite data (Deer, Howie and Zussman, 1963). Specific gravity determined by pycnometer at 20°C gives 2.804.

X-ray Data. X-ray diffraction data for muscovite are obtained using an
X-ray diffractometer with Ni-filtered CuKα (1.5418 Å) radiation. X-ray diffraction data for muscovite agree well with the indexed powder data of synthetic $2M_1$ polymorph given by Yoder and Eugster (1955; XRDF card 7–32). Using that indexing the following unit cell edges were obtained with silicon metal as an internal standard: $a = 5.174 ± 0.003$, $b = 9.051 ± 0.003$, $c = 20.010 ± 0.003$ ($c \sin \beta = 19.930$), and $\beta = 95°20'$. The $c$ value of the muscovite is slightly smaller than that of $2M_1$ muscovite due to the substitutions of Na for K in the sheets.

Chemical data. Chemical analysis by Kazuso Nakao and Kazuo Harada on 3.5 g of pure sample gave: SiO$_2$ 46.69, TiO$_2$ 1.77, Al$_2$O$_3$ 31.82, Fe$_2$O$_3$ 1.42, FeO 1.33; MnO, 0.02; MgO, 3.02; CaO, 0.98; Na$_2$O, 1.42; K$_2$O, 7.29; H$_2$O (total) 4.30 and total 100.06.

When O+OH are set to be 13, this corresponds to

$$(K_{0.619}, Na_{0.186}, Ca_{0.070})(Al_{1.487}, Fe_{0.071}, Fe_{0.071}, Mg_{0.298})$$

$$\cdot [(OH)_{1.902} | Al_{1.000}, (Si_{0.067}, Ti_{0.088})_{3.156}O_{10}]$$

or

$$(K, Na, Ca)_{0.869}(Al, Fe^{3+}, Fe^{2+}, Mg)_{1.930}[OH_{1.902}Al_{1.000}(Si, Ti)_{2.156}O_{10}]$$

This formula agrees with muscovite (OH$_2$KAl$_3$Si$_3$O$_{10}$) (Strunz, 1970), but considerable amounts of Mg proxy for Al and Na for K. The specimen from Amakusa contains 18 mol. percent of paragonite end-member.

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ON THE OPTICAL SPECTRA OF DI- AND TRIVALENT
IRON IN CORUNDUM: A DISCUSSION

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INTRODUCTION

The color and pleochroism of blue kyanite (Al₂SiO₅) has been attributed to traces of
Ti³⁺ by White and White (1967); however, subsequently, Faye and Nickel (1969) showed
that these optical properties could be accounted for more readily on the basis of Fe²⁺→Fe³⁺
charge-transfer processes. This writer contends that the latter interpretation is supported
by the spectra of iron-bearing corundum reported recently in this journal by Lehmann and
Harder (1970). However, the correlation of the spectra of blue kyanite with that of the
iron-corundum suggests that aspects of Lehmann and Harder's interpretation of certain of
their spectra are open to question.

DISCUSSION

Figure 1 shows the polarized optical spectra of blue kyanite [Figure
1(a)] and Fe³⁺-corundum [Fig. 1(b)] approximately in the 8,000 to 22,000
cm⁻¹ range. It is evident that each absorption envelope is composed of
two polarized components; however, only the high-energy band lies in the
visible region and it is largely responsible for the colour and pleochroism
of the mineral.

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